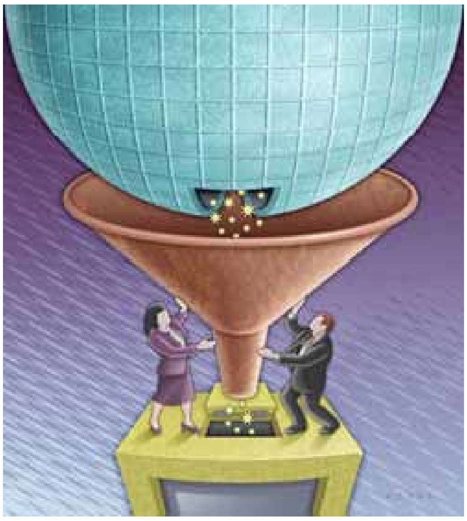
In-home Networks: the Next Frontier

Fibre-To-The-Wall

…and then what?

Outline

- NBN Deployment
- In-home Reticulation for the NBN
- Multiple Networks
- Multiple Providers
- Some things the NBN may make worse



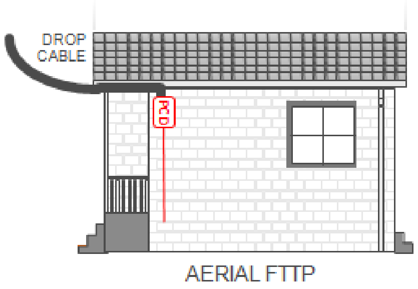
Fibre-To-The-Wall…than what?

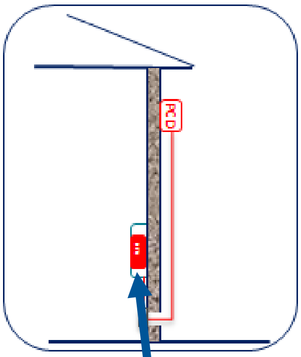
NBN is the third optical fibre transformation

- Lasers invented 1960, low-loss optical fibre late 1970's
- 1980/90's – interexchange network converted to fibre
- 1992-4 – first Australian submarine optical fibre cables (Tasman2, PacRimWest, PacRimEast)
- *2010s – Customer Access Network changes to fibre*
- *? - In-home cabling changes to fibre?*

No – Not required!

Fibre-To-The-Floor…



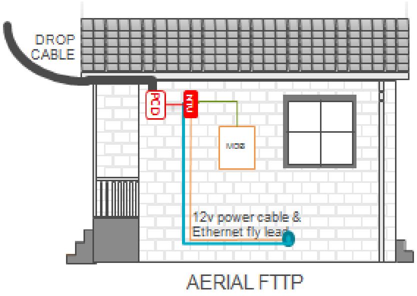


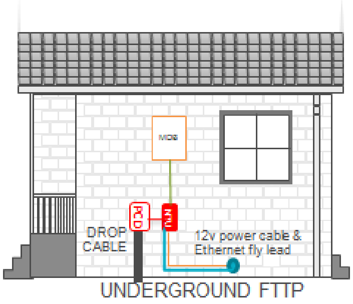
NBNCo "Connecting to the NBN" Consultation Paper, 25/10/10

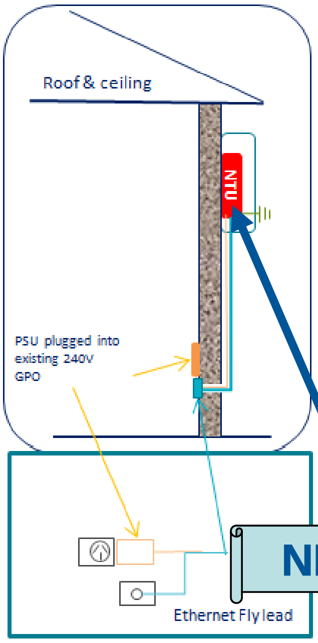
NBN Network Boundary

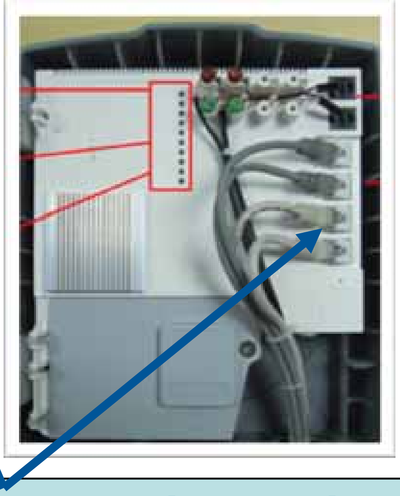
Skylinebob "NBN Tas Midway Point"
http://s212.photobucket.com/albums/cc69/skylinebob/NBN%20Tas%20Midway%20Point/

Fibre-To-The-Wall…





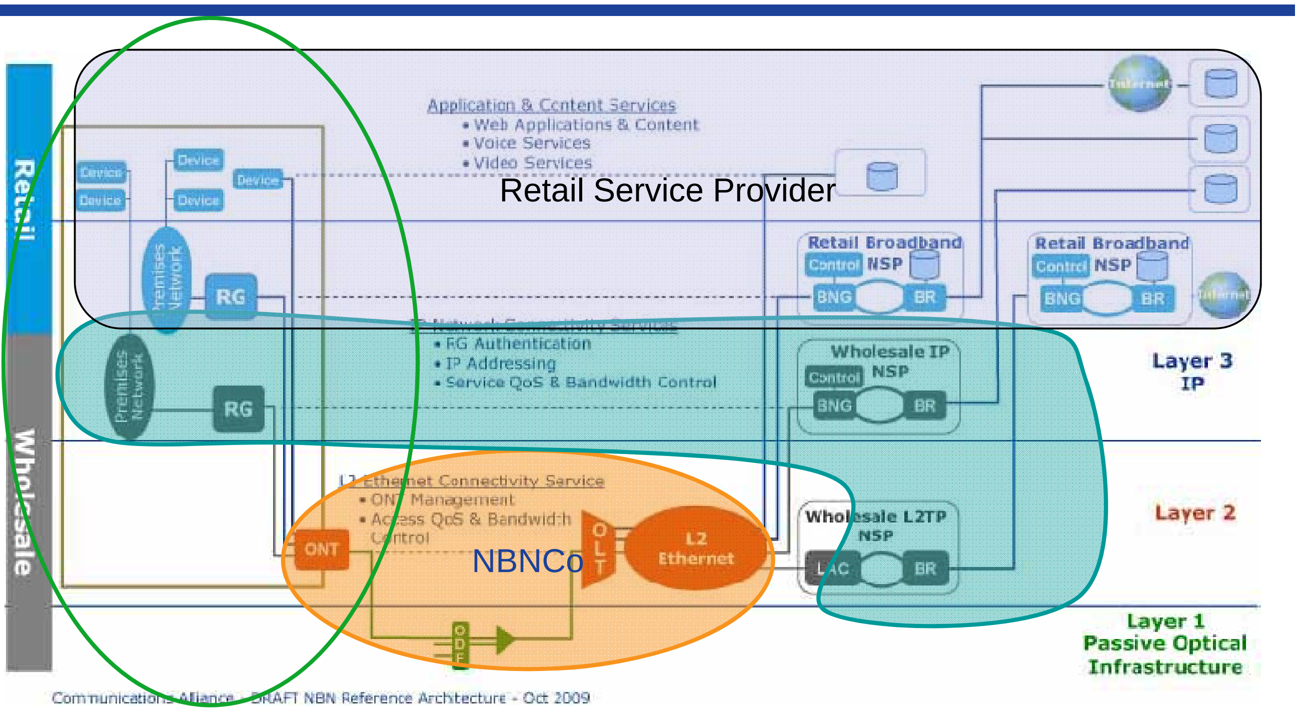




NBN Network Boundary

NBNCo "Connecting to the NBN" Consultation Paper, 25/10/10

Layered Relationships

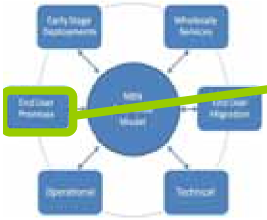


Communications Alliance - DRAFT NBN Reference Architecture - Oct 2009

In-home Distribution

- With the “first mile” solved, the problem moves to the “first 5 metres”
- How to get the broadband signal from the modem, located usually in the study or the garage, to the:
  - home office
  - kids laptops
  - television(s)
  - PVRs under the TVs
  - telephone points
  - alarm system
  - security camera(s)
  - smart meter
  - smart meter display

End User Premises Handbook



COMMUNICATIONS ALLIANCE LTD

NATIONAL BROADBAND NETWORK
END USER PREMISES INSTALLATION, DISTRIBUTION, TESTING AND ASSOCIATED PRACTICE HANDBOOK

DRAFT FOR COMMENT

DECEMBER 2009

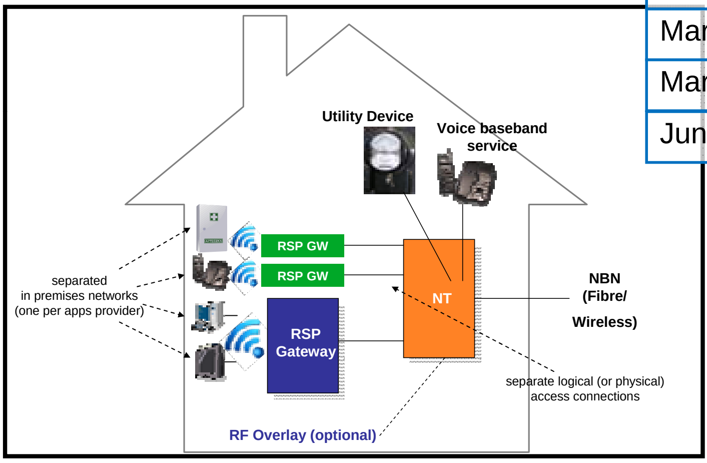
End User Premises Handbook – June 2010

Architecture Overview
Architecture Components
Architecture – Wireless/Satellite Access
Distribution Technologies
Installation Practices
Testing and Diagnostics
Sustainability
Robustness
Security
IPv6
Future Proofing
Industry Codes and Practices
References

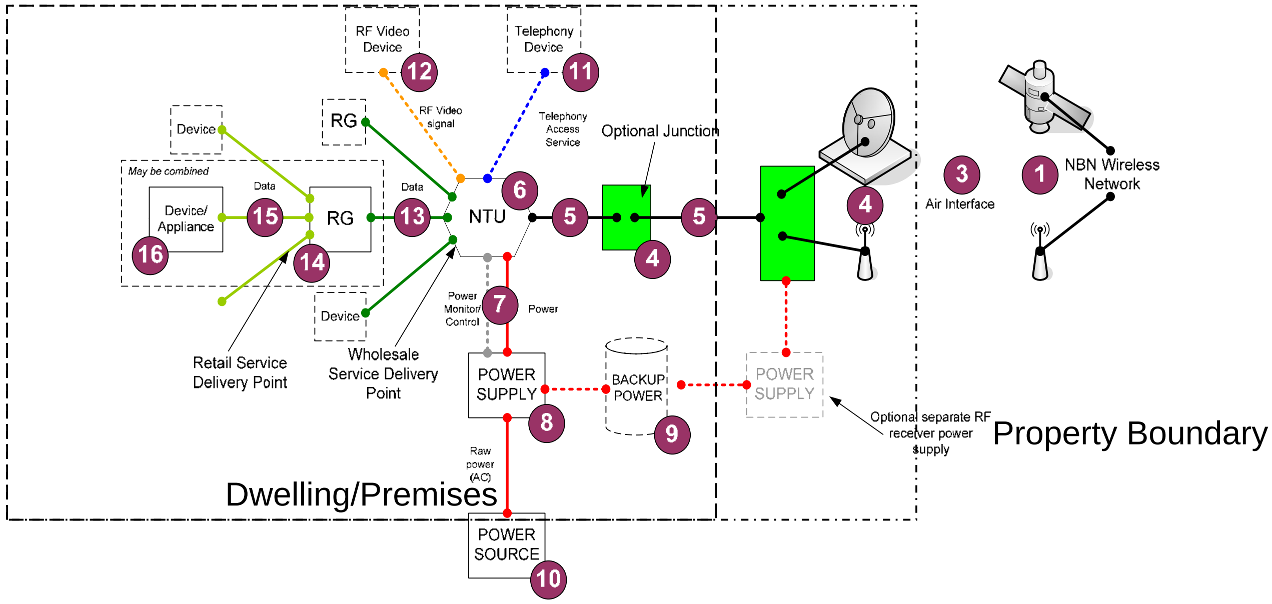
End User Premises Handbook

End User Premises Handbook

Jan 2010 – Draft for Comment released
Feb 2010 – Public comment period
Mar 2010 – Satellite & Wireless Workshop
Mar 2010 – Release 1 finalised)
June 2010 – Release 2


Utility Device
Voice baseband service
separated in premises networks (one per apps provider)
RSP GW
RSP GW
RSP Gateway
NT
NBN (Fibre/ Wireless)
separate logical (or physical) access connections
RF Overlay (optional)

End User Premises – Functional Model



CommsAlliance (2010) "NBN End-User Premises Handbook", http://www.commsalliance.com.au/__data/assets/pdf_file/0008/23957/NBN-End-User-Premises-Handbook---Release-2-Jun10.pdf

---

Distribution Technologies

Wireless?

- POLL - How many other people's WiFi networks are detectable from your home?

None

1

2

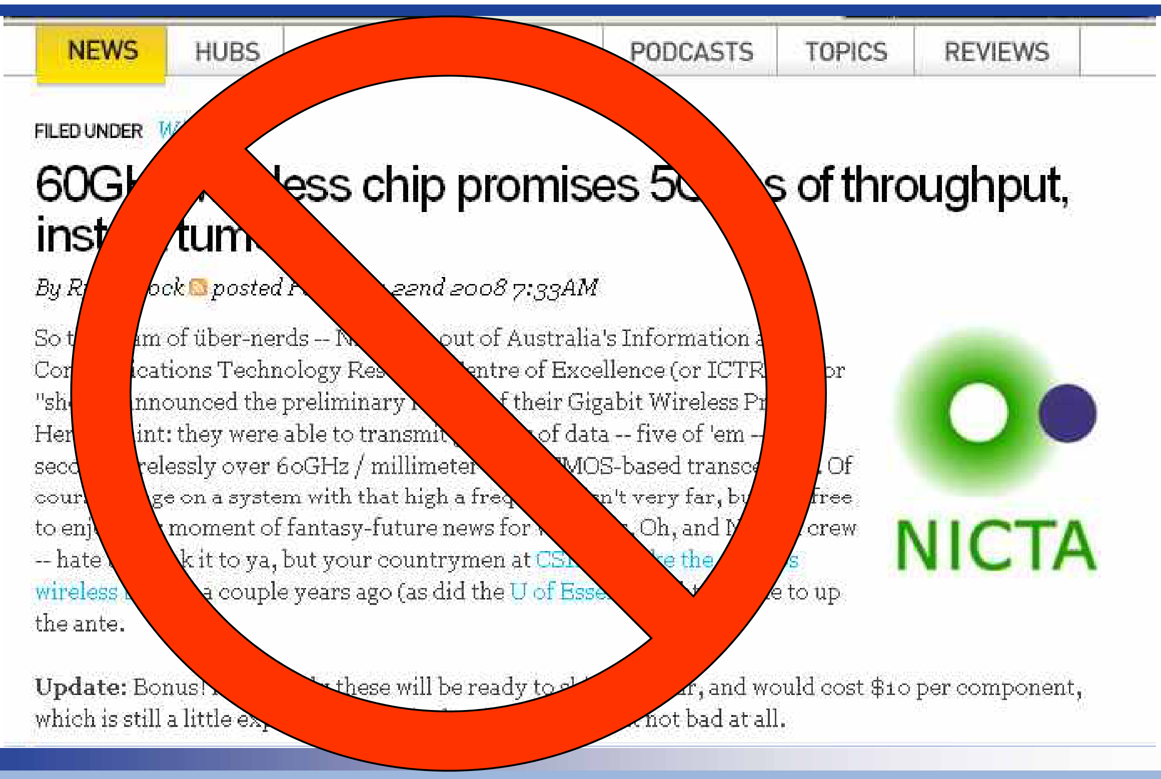
3

4 or more

Wireless?

- 802.11n – 150 (-300) Mbps link, 45 – 60 Mbps throughput - shared
- Wifi is Half-Duplex – device-to-device transfers slow, transmitted twice
- Range is limited, especially in 5 GHz spectrum
- Vulnerable to interference from others nearby
- Blocked by brick walls, foil insulation

NICTA 5 Gigabit Wireless



FILED UNDER W[illegible]

60GH[illegible] [illegible]less chip promises 5[illegible] [illegible]s of throughput, inst[illegible] [illegible]tum[illegible]

By R[illegible] [illegible]ock posted F[illegible] [illegible] 22nd 2008 7:33AM

So t[illegible] [illegible]m of über-nerds -- N[illegible] [illegible]out of Australia's Information a[illegible] Cor[illegible] [illegible]ications Technology Res[illegible] [illegible]entre of Excellence (or ICTR[illegible] [illegible]or "sh[illegible] [illegible]nnounced the preliminary [illegible] [illegible]f their Gigabit Wireless Pr[illegible] Her[illegible] [illegible]int: they were able to transmit [illegible] [illegible] of data -- five of 'em -- seco[illegible] [illegible]relessly over 60GHz / millimeter [illegible] [illegible]MOS-based transce[illegible] Of cour[illegible] [illegible]ge on a system with that high a freq[illegible] [illegible]n't very far, bu[illegible] [illegible]free to enj[illegible] [illegible] moment of fantasy-future news for [illegible] Oh, and N[illegible] [illegible]crew -- hate [illegible] [illegible]k it to ya, but your countrymen at CSI[illegible] [illegible]te the [illegible] [illegible]s wireless [illegible] [illegible]a couple years ago (as did the U of Esse[illegible] [illegible] [illegible]e to up the ante.

Update: Bonus! [illegible] [illegible]y these will be ready to s[illegible] [illegible]r, and would cost $10 per component, which is still a little ex[illegible] [illegible] not bad at all.

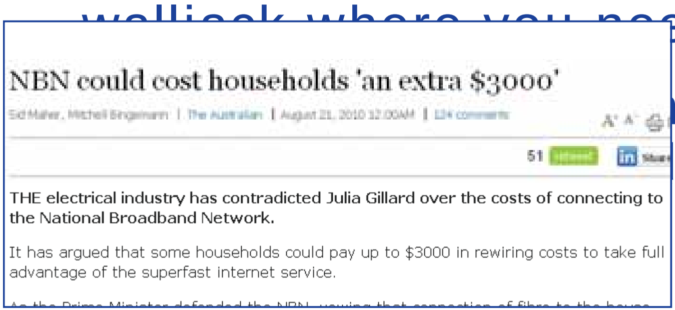
Gigabit Wireless

- WiFi Alliance working on WiGig – 7 Gbps using 60GHz band
- IEEE working on 802.11ad – 1 Gbps using 60 GHz band
- 60GHz range is line-of-sight – probably only 5 – 9 metres
- Great for eliminating cable-nest behind TVs
- Useless for laptops by the pool

(Scheduled for July-Dec 2012)

LAN Cabling?

- Not optical fibre cable
  - no devices with fibre sockets
  - no single standard plug
  - No need for kilometres of range
- Cat5/6 cable – cheap in new houses, expensive to retrofit
- Subject to Murphy – never a walljack where you need it



NBN could cost households 'an extra $3000'

Sid Maher, Mitchell Bingemann | The Australian | August 21, 2010 12:00AM | 124 comments

THE electrical industry has contradicted Julia Gillard over the costs of connecting to the National Broadband Network.

It has argued that some households could pay up to $3000 in rewiring costs to take full advantage of the superfast internet service.

G.HN – Home Networking (ITU-T G.9960, G.9961)

Oct 2009 - G.9960 Physical Layer & Architecture

Jun 2010 - G.9961 DataLink Layer approved

- Unifies HomePlug Alliance, Phonenet/HomePNA & MoCA into single coherent system
- Existing phone, coax and power cables become distributed LAN

HomeGrid FORUM

For any wire, anywhere in your home.™

G.HN – Home Networking (ITU-T G.9960, G.9961)

- **600 Mbps to 1 Gbps throughput**
- **AES128 encryption – by default**
- **Ethernet QoS prioritisation**
- ‘Green’ – deep sleep states complies with European Code of Conduct
- Customer Installable – to be embedded in STBs, PVRs etc.
- Even existing houses have many powerpoints

Ethernet-over-Powerline

- Powerline variant is most relevent G.HN line for Australia
- Gen 1: 45 Mbps proprietary
- Gen 2: 200 Mbps “Powerline AV” proprietary - avail now
- Gen 3: 800 Mbps G.HN should be available this year

Embeddable Networking

- Every device requires a powercord anyway
- G.HN module can be embedded within the device powersupply
- Broadband Router, PVR, Games console, DVD player, Fridge, IP Phone…no network cable required
- Home Networking by stealth??

Multiple Networks

- What do these devices have in common?
  - home office
  - kids laptops

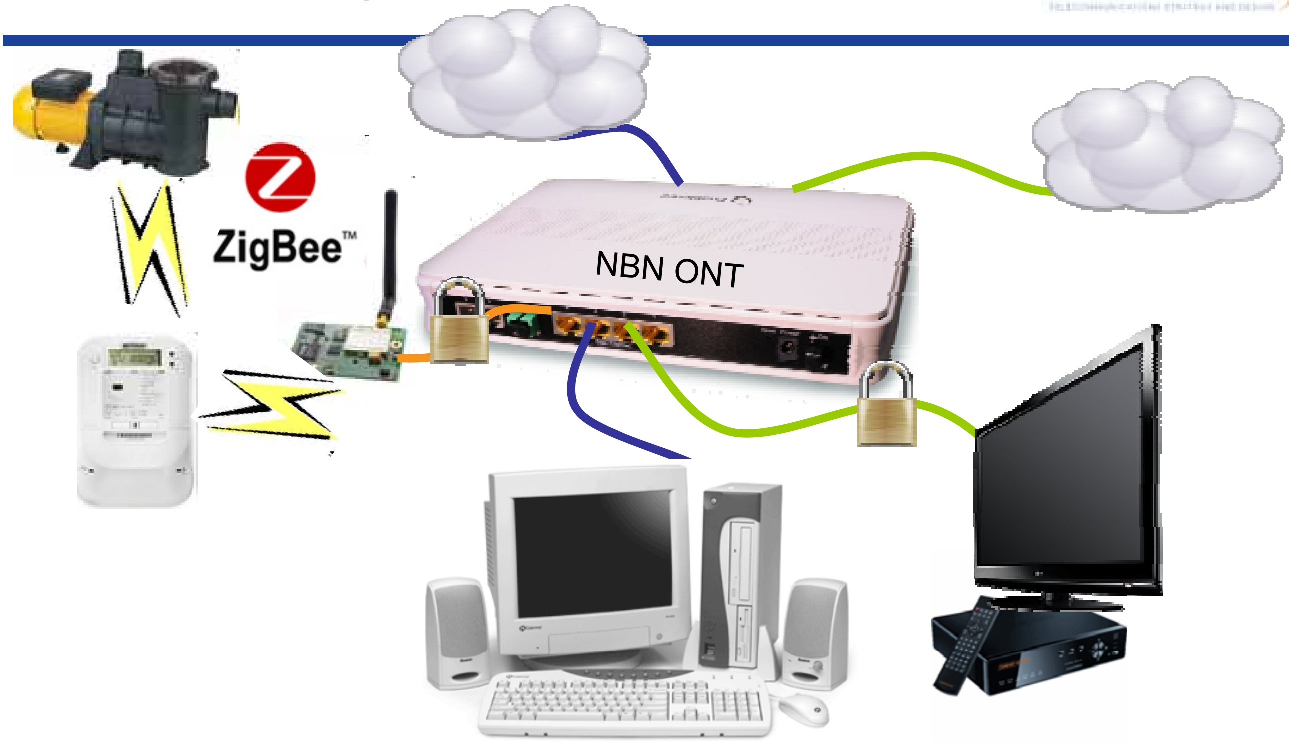
  - television(s)
  - STBs and PVRs under the TVs

  - telephone points

  - alarm system
  - security camera(s)

  - smart meter
  - smart meter display

Issue – Multiple Secured Networks



Multiple parallel secured networks (VLANs?)

Multiple Providers

Ultimate Competition and Choice

- 4 ethernet, 2 PSTN ports per residence
- Each port may connect to a different service provider
- **QoS-Enabled end-to-end**
- **Ethernet – RSPs can provide ANY Layer 3 protocol**

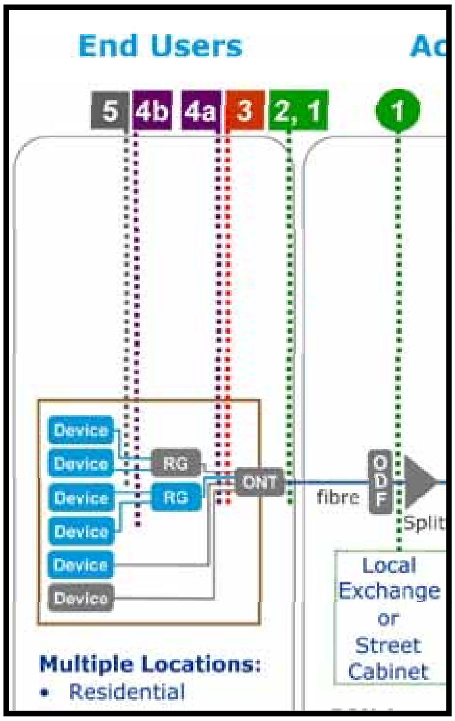
EtherType	Protocol
0x0800	**Internet Protocol, Version 4**
0x6003	DECnet Phase IV
0x809B	AppleTalk (Ethertalk)
0x80F3	AppleTalk Address Resolution Protocol (AARP)
0x8100	VLAN-tagged frame (IEEE 802.1Q)
0x8137	Novell IPX
0x86DD	**Internet Protocol, Version 6**
0x8819	CobraNet
0x8847	**MPLS unicast**
0x8848	**MPLS multicast**
0x888E	**EAP over LAN (IEEE 802.1X)**
0x889A	**SCSI over Ethernet(HyperSCSI)**
0x8906	**Fibre Channel over Ethernet**
…..	……

Ultimate Competition and Choice

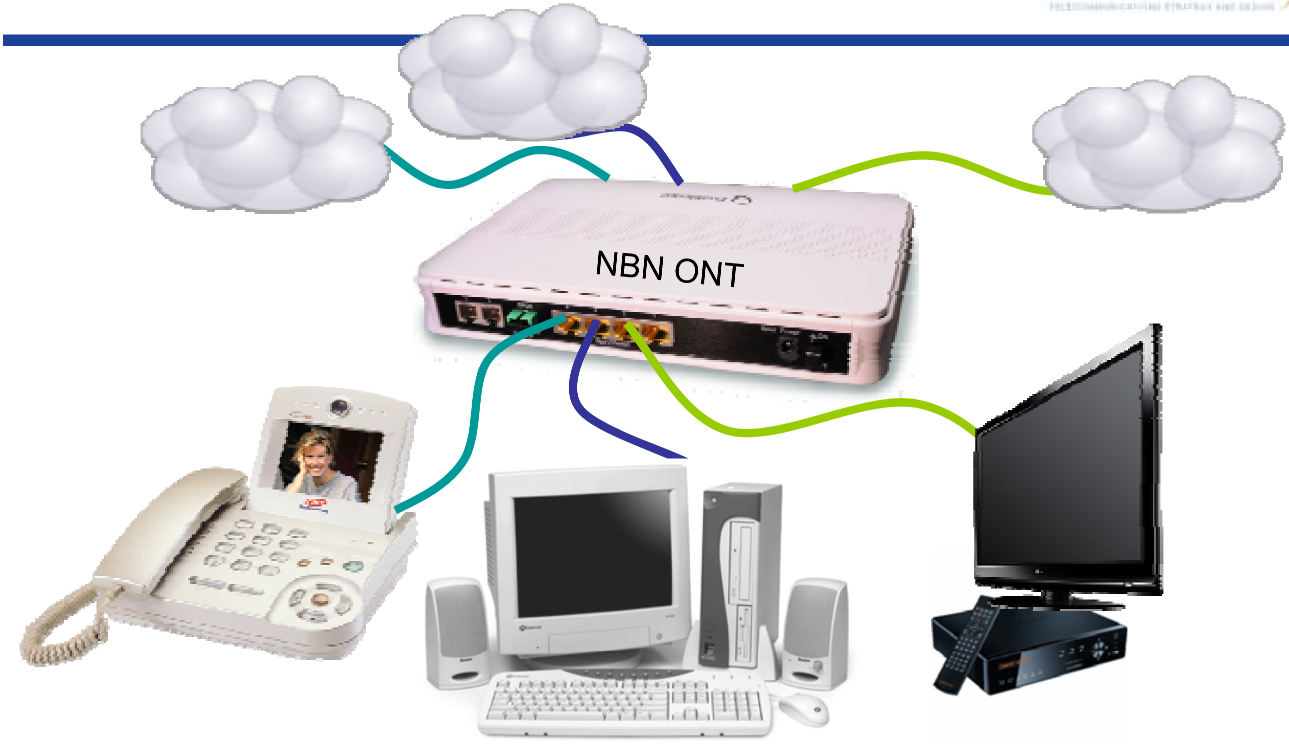
- First Era (– ~1990) **No Choice**
  - Monopoly network, services and Service Provider
- Second Era – (1990 – 2010) **Choose One from Many**
  - Multiple possible service providers
  - Issues with Churn, Migration, Portability
- Third Era – (2010-) **Choose Several from Many**
  - Trial alternative providers without disconnecting
  - Use Best-fit-for-purpose service depending on time of day?
  - No ‘gatekeeper effect’ capturing – better network neutrality

With Choice Comes Complexity

- Up to 4 ethernet, 2 PSTN ports per residence
- Each port may connect to a different service provider
- Consumer will need to choose providers
- Consumers may need to keep track of which service is with which service provider – on which port
- Consumers now involved with service cabling
- Services of same technology may not play together

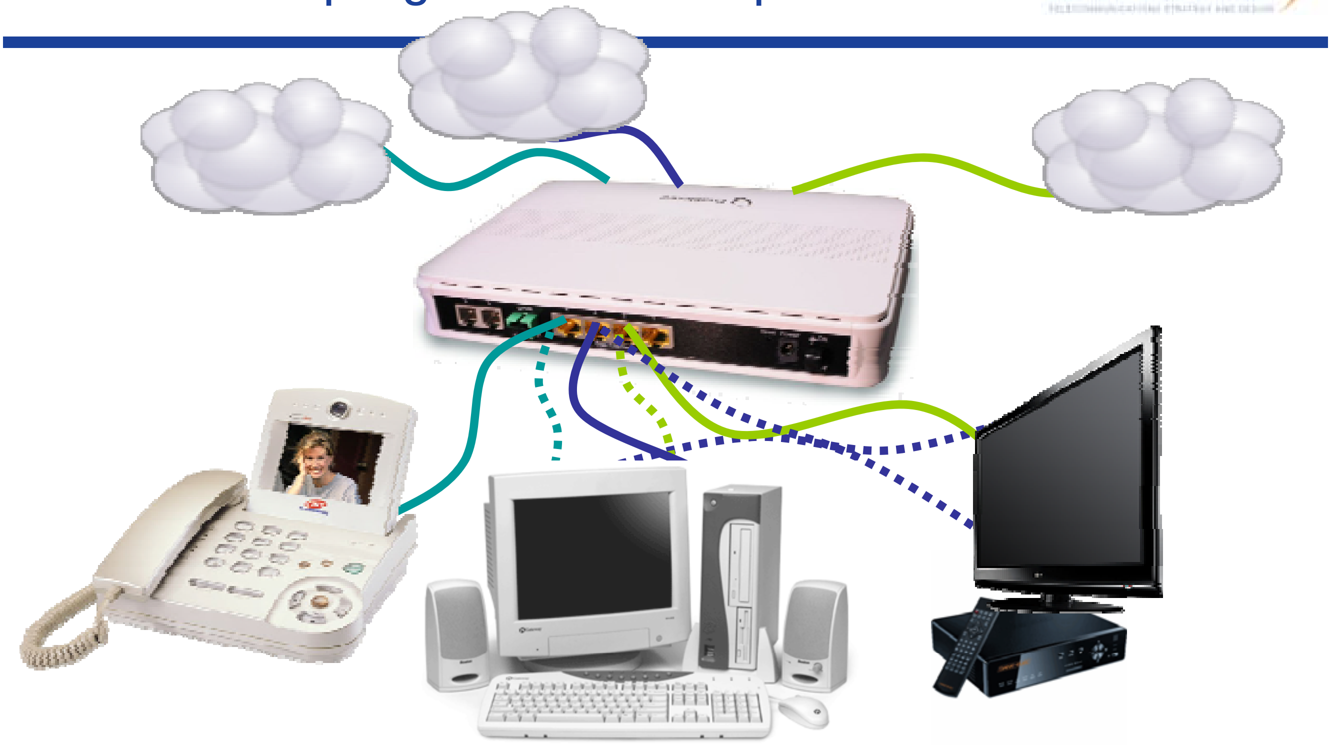


Issue – Keeping Services Separated



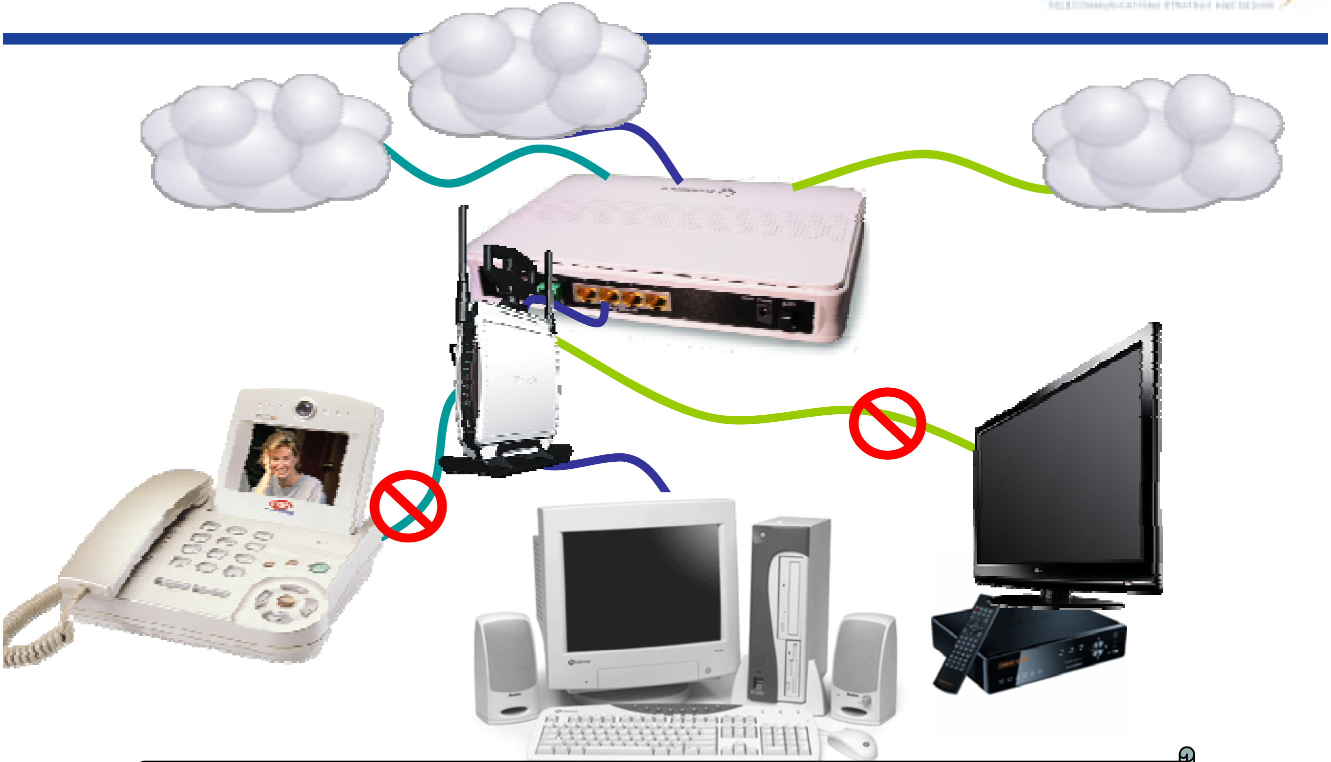
What service & content providers want...

Issue – Keeping Services Separated



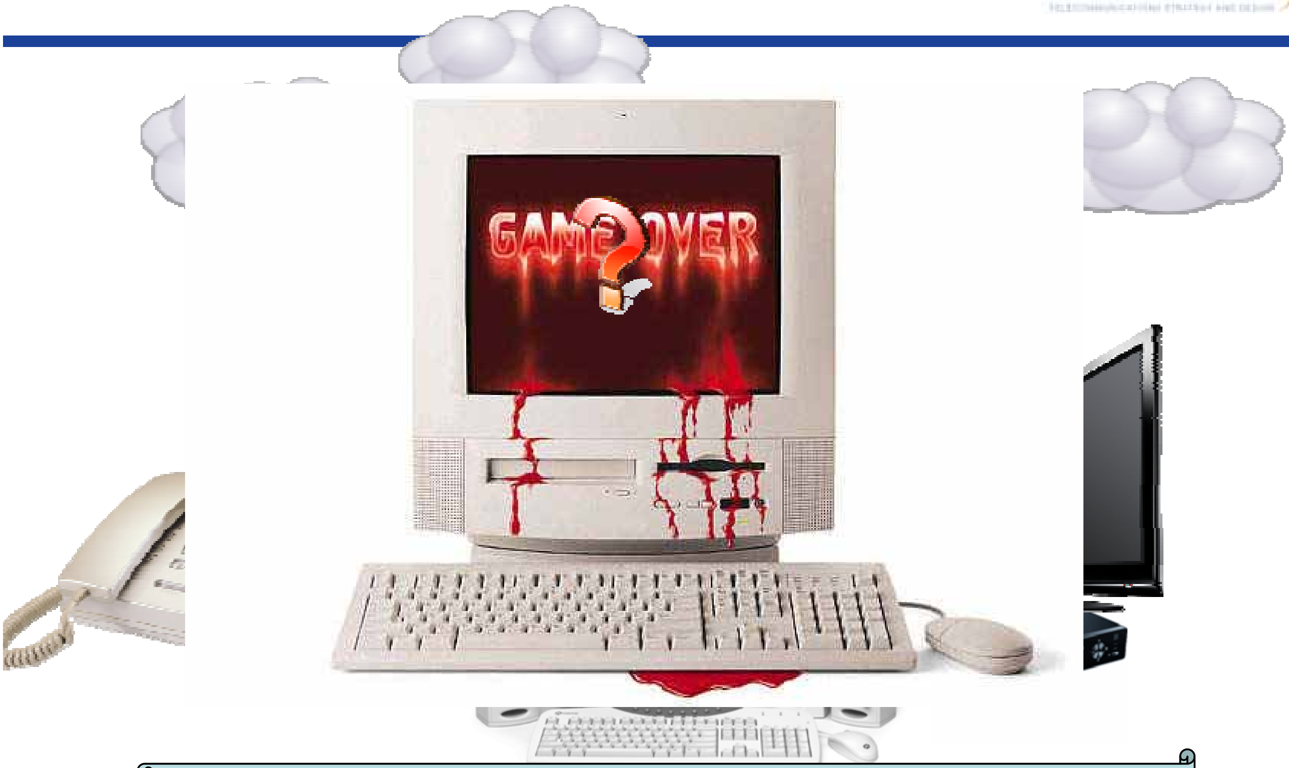
What consumers want…

Issue – Keeping Services Separated



What consumers will do (1)

Issue – Keeping Services Separated



What consumers will do (2)

Keeping Services Separated

Broadband gateways work by ‘default routing’ to **the** WAN port – singular

How to handle multiple upstream paths?

How to handle different IP address ranges?

How to handle the same overlapping IP ranges?

Have each ISP send routing information to every customer?

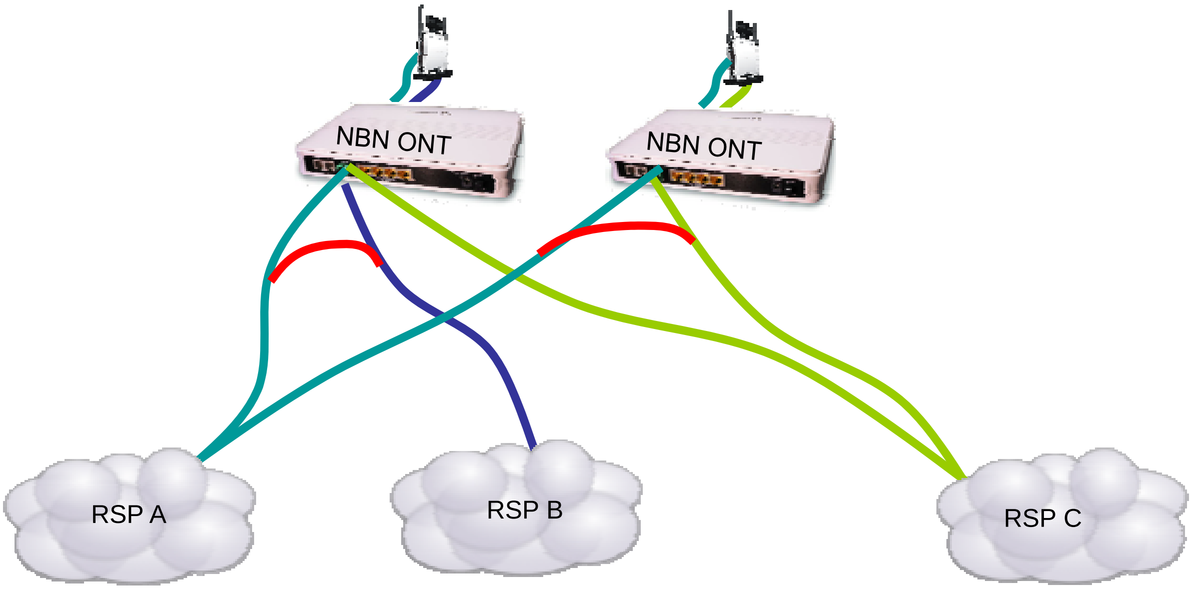
- Trust ISP? fake routing?

Have every device dual-homed to SP and home LAN?

- (hardware easy – software hard)

Issue – Keeping Service Providers Separated (2)

…at up to ~10,000,000 locations nationwide?

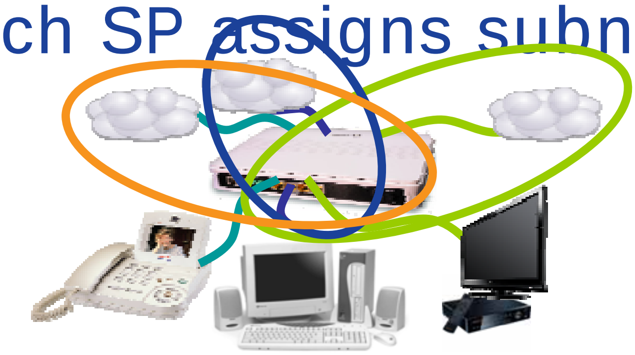


How to handle 500+ other RSP networks that might be bridged into yours?

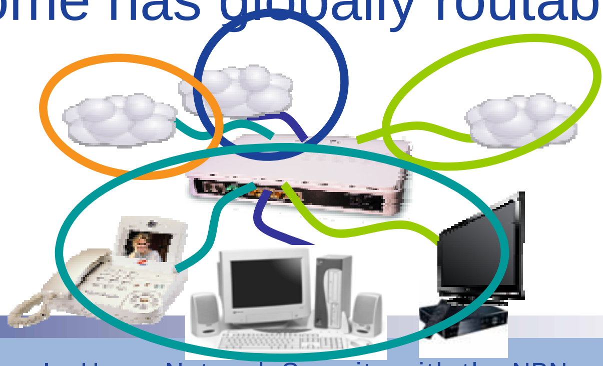
IPv6 Part of the Solution

IPv6 a solution?

IPv4 each SP assigns subnet



IPv6 the home has globally routable subnet



May you find what you are looking for

None of this is the “fault” of the NBN, or NBN Co. The NBN will be working perfectly!

The NBN and the telecoms industry will be delivering maximum choice, maximum flexibility, maximum competition on a level playing field.

Just like we’ve wished for over 20 years or more.

May you find what you are looking for

Can we keep the multiple networks secured?

Thankyou

Paul Brooks

pbrooks@layer10.com.au